STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Water Supply Systems**		Code **1010102211010130356**
Field of study **Environmental Engineering Second-cycle**	Profile of study (general academic, practical) **(brak)**	Year /Semester **1 / 1**
Elective path/specialty **Water Supply, Water and Soil Protection**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **30** Classes: **30** Laboratory: **-** Project/seminars: **15**		No. of credits **5**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art		ECTS distribution (number and %)

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge acquired at courses delivered earlier during First and Second-cycle studies of Mechanics of Fluids, Water Supply, Mathematics
2	**Skills**	Use of knowledge obtained and skills acquired as part of subjects mentioned above, especially Water Supply. Self-learning ability
3	**Social competencies**	Awareness of the need to constantly update and supplement skills and knowledge

Assumptions and objectives of the course:

Widening and deepening of knowledge and skills acquired in the first-cycle studies required to solve complex engineering problems that concern water supply

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Student knows water supply systems calculation methods - [K2_W01, K2_W03]
2. Student can perform calculation of selected hydraulic power systems - [K2_U05, K2_U09, K2_U10]
3. Student is able to build input data basic structure necessary to build computer models of water distribution system - [K2_U01, K2_U05, K2_U07, K2_U08, K2_U09, K2_U10]
4. Student can identify parameters that may cause adverse effects in water distribution systems - [K2_U01, K2_U05, K2_U07, K2_U08, K2_U09, K2_U10]
5. Student understands the need to check and verify obtained results - [K2_U01, K2_U08, K2_U10, K2_U15]

Skills:

1. Student can prepare performance characteristics of selected sources of water supply systems - [K2_U05, K2_U09, K2_U10]
2. Student can perform calculation of selected hydraulic power systems - [K2_U05, K2_U09, K2_U10]
3. Student is able to build input data basic structure necessary to build computer models of water distribution system - [K2_U01, K2_U05, K2_U07, K2_U08, K2_U09, K2_U10]
4. Student can identify parameters that may cause adverse effects in water distribution systems - [K2_U01, K2_U05, K2_U07, K2_U08, K2_U09, K2_U10]
5. Student understands the need to check and verify obtained results - [K2_U01, K2_U08, K2_U10, K2_U15]

Social competencies:

1. Student sees the need to systematically increase their skills and competences - [K2_K01]
2. Student understands the need to work in a team to solve theoretical and practical problems - [K2_K01, K2_K03, K2_K04]
3. Student is aware of an impact of their decisions on activities (results obtained during auditorium exercises and projects) - [K2_K02, K2_K05]

Assessment methods of study outcomes

Final exam:

One part written exam (80min). Its timing is confirmed in the first of week of the semester. Exam consists of a few open questions. The goal is to assess knowledge gained during lectures (learning effect W1 to W6).

Range of scale: NB-absent; 2(?23 points); 2,5 (23,5 points); 3 (24-28 points); 3,5 (29-33 points);4,0 (34-38 points); 4,5 (39-43 points); 5 (44-46 points).

Practical exercises :

Part 1: Calculation of tasks and design of a drilled well. At the end of the colloquium with tasks related directly to the design of the well.

Part 2: Tutorials: evaluation of presentation prepared in subgroups, test

Choice of one of subjects suggested by the lecturer, delivery of a presentation and its defence ? work done in subgroups (learning effect: W5, W6, K1, K2, U1, U2, U4).

Scale range: (NB; 2,0; 2,5; 3,0; 3,5; 4,0; 4,5; 5,0). To pass student has to obtain min. 50% points.

Part 3: 40min written examination test that includes a dozen multiple choice and two open questions. To pass this topic student must to obtain min. 50%

Continuous assessment during classes, rewards for activity (learning effect K1).

Project exercises:

Practical exercises: evaluation of advanced projects (learning effect U01, U02, U03, U04, U05, K1, K2, K4).

Continuous assessment of project completion at each class ? rewards for activity (learning effect K1).

Range of scale: (NB;2,0;2,5;3,0;3,5;4,0;4,5;5,0). To pass this project student has to obtain positive rate and min.60% correct performed tasks.

Course description

Lectures:

1. GIS basics that concern water distribution systems modelling.
2. Allocation of water demand points integrated with GIS system points. Spatial data models.
3. Development of informatics tools for modelling water distribution systems. Modelling with an application of computer programs. Stages of model construction.
4. Data acquisition methods for construction of water supply network models. Use of a computer model to analyse and evaluate a water supply system.
5. Calibration, verification and validation methods of hydraulic water distribution systems models.
6. Water intakes. Types of shots and ways of capturing surface water and underground water.
7. Numerical terrain models. Create spatial-descriptive queries in SQL
8. Piping Systems Calculation (Series and Parrallel).
9. Tasks carried out by measuring equipment for monitoring of water supply networks.

Exercises topics:

Part 1:

Calculation of tasks and design of a drilled well. Tasks:

1. Determination of the filtration coefficient by means of trial pumping.
2. Determination of the soil type of the aquifer based on the graining curve.
3. Filter selection and dimensioning of components and reinforcement of the drilled well.
4. Pump selection.
5. Technical drawings, cross-section and as-built drawing.

Part 2:

6. Management of water quality in water supply systems and risk analysis.
7. Secondary water contamination in water systems.
8. Modelling of changes of quality.

Exercise topics (project):

1. Calculation of water demand for a given customer group.

2. Design a water network (location, diameter).
3. Design a pump station (hydraulic and efficiency curves).
4. Control theory-based simulation methods.
5. Calculation and analysis variety of the models in hydraulic model based on EPANET 2.0.14 software.

Learning methods:

1. Lectures: All lectures are presented in the form of multimedia presentations. Selected topics are discussed in the problematic perspective. The lead person then uses the plate from the table.

2. Exercises: The content of the topics discussed and their detailed description of the work is available on the web site (unlimited access). In addition, a person using the projector shows how to perform specific tasks. For second task, all possible topics will be discuss and lecturer explains the way of preparing each presentation.

3. Project: The scope of the project is divided into stages. Every stage are presented in a short multimedia presentation (about 15 minutes). Then, during discussion and questions, based on the example, teacher explain the different ways of performing each task (15min). The last 60min is devoted to an individual assessment of each stage of the project implementation.

Basic bibliography:

1. Mielcarzewicz E., Obliczanie systemów zaopatrzenia w wodę, Arkady, Warszawa 2001.
2. Grabarczyk Cz., Hydraulika urządzeń wodociągowych, Warszawa, WNT, 2015 (tom1 i 2).
3. Dąbrowski S., Metodyka próbnych pompowań w dokumentowaniu zasobów wód podziemnych, Poradnik metodyczny, Warszawa, 2005.
4. Kwietniewski M. i inni, Projektowanie elementów systemu zaopatrzenia w wodę, Wydawnictwo Politechniki Warszawskiej, Warszawa 1998
5. Kwietniewski M., GIS w wodociągach i kanalizacji, PWN, Warszawa, 2008.

Additional bibliography:

1. Rossman L. A., EPANET 2 Users Manual, US EPA, 2000
2. Boulos P.F. , Lansey K.E., Comprehensive Water Distribution Systems analysis Handbook for engineers and planners, MWH Soft., USA, 2006
3. Manual of Water Supply Practices M32, Computer Modeling of Water Distribution Systems, AWWA, USA, 2005
4. Szuster-Janiaczyk Agnieszka (IK)., Zarządzanie jakością wody w systemach wodociągowych, XIX Krajowa, VII międzynarodowa konferencja naukowo-techniczna : zaopatrzenie w wodę, jakość i ochrona wód, Zakopane, 18-21 czerwca 2006 r. / red. Andrzej Królikowski, Marek M. Sozański / PZIiTS Oddz. Wielkopolski [i in.] [org.]. - Poznań : PZIiTS Oddz. Wielkopolski. - T. 1, 2006. - S. 863-883
5. Bałut A, Bylka J., Modele komputerowe jako narzędzia wspomagania w procesie zarządzania układami rozprowadzającymi wodę w systemach wodociągowych, Instal, nr 12, str.91-96, 2013r.
6. Urbaniak A., Bałut A., Brodziak R., Bylka J., Technologie IT w realizacji idei zrównoważonego rozwoju w systemach zaopatrzenia w wodę, Instal, nr 10, str.76-79, 2015r.

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	30
2. Participation in exercises	30
3. Participation in practical exercises	15
4. Participation in consultations related to exercises	3
5. Preparation for the exercises	7
6. Preparation for the practical exercises	14
7. Preparation for the exam	24
8. Presence at the exam	2

Student's workload

Source of workload	hours	ECTS
Total workload	125	5
Contact hours	94	3
Practical activities	45	1